EPA United States Environmental Protection Agency
Air and Radiation (6202J)
EPA 430-F-96-054
October 1996

APPLICATION PROFILE

Occupancy Sensors in Industrial Settings

EPA Green Lights
an ENERGY STAR program

Whitehill Lighting, State College, PA

Whitehill
LIGHTING & SUPPLIES
Energy Conservation Program

Whitehill Lighting & Supply Inc.
State College, Pennsylvania

Manager of Sales and Operations: Mike Fuller

Contractor:
In-House

Utility:
West Penn Power

PROJECT RESULTS

Installed Cost	$517
Annual Cost Savings	$1,100
Simple Payback	0.5 years
Annual kWh Savings	15,920 kWh
Pollution Prevented	
CO_2	25,472 lbs/yr
SO_2	288 lbs/yr
NO_x	91 lbs/yr

TYPICAL APPLICATIONS

- Warehouses
- Storage Areas
- Automated Process Areas
- Electric Generating Stations
- Chemical Process Plants

OCCUPANCY SENSOR CONTROL IN INDUSTRIAL SETTINGS

For help in starting an occupancy sensor control program, contact a Green Lights Lighting Management Company Ally. For a list of these companies, call the Green Lights Hotline at 1-888-STAR-YES.

From raw materials processing to final product assembly, the variety of space types in industrial areas offer excellent opportunities for profitable pollution prevention through occupancy sensor control. Consider a warehouse, a shipping/receiving area or a storage room, areas that can be lighted for entire shifts or days, yet are infrequently or unpredictably occupied. A properly commissioned occupancy sensor can play an important role in aggressive energy management while accommodating changing tasks and variable usage patterns.

Occupancy sensors are suitable for a wide range of lighting applications. Sensors are most commonly mounted in switch locations, combinations of wall/corner surfaces, or ceiling mounted above the center of a space. Two motion-sensing strategies are prominent; passive-infrared and ultrasonic technologies. Infrared sensors detect body heat and require a direct "line-of-sight" to occupant motion. Ultrasonic sensors emit and receive ultra high-frequency sound waves well above the range of human hearing. They are better at recognizing motion hidden from the sensor's direct view. Some occupancy sensors are also equipped with an integral photocell to combine daylighting control with occupancy control.

The specification, placement and installation of occupancy sensors should be done by experienced, knowledgeable personnel. For a successful application, proper calibration is a must. Most sensors have adjustments for sensitivity to ensure that occupant motion is detected while filtering out extraneous signals, and for time delay to minimize excessive on/off cycling. Sensors equipped with photocells also have a light level setpoint adjustment to turn lights off in a room when adequate daylight is available. Trial installations are an excellent way to address many of these issues.

Benefits

- **Complimentary Technology:** Occupancy sensors make an excellent compliment to many lighting technologies, offer additional HVAC savings and security advantages, and are often the most cost-effective component of a lighting upgrade.
- **Peak Demand Period Opportunities:** Occupancy sensors are the only effective control strategy that allow for lighting run-time reductions during business hours. Demand charges often account for 20-50% of an energy bill.
- **Immediate and Flexible Savings:** A properly commissioned occupancy sensor can immediately adapt to many workplace variables while remaining a low-maintenance component of lighting systems.

Issues

- **False Switching:** Occupant anxieties related to false switching can be addressed through careful specification of detection strategy, installation position, and post-installation commissioning.
- **Lamp Life:** Although fluorescent lamp life is reduced by frequent switching, the overall reduction in operating hours can extend the calender life for lamps.
- **Energy, Demand, and $ Savings:** Demand and energy rate structures must be considered to ensure that anticipated energy savings yield cost savings.
- **HID Systems:** The long warm-up and restrike times required by metal halide and high- pressure sodium lamps have historically prevented occupancy sensor control of HID lamps. New bi-level switching and instant restrike lamps allow for profitable application of sensors in many HID systems.

CASE STUDY

Whitehill
LIGHTING & SUPPLIES
Energy Conservation Program

Whitehill Lighting & Supply Inc.

Whitehill Lighting already had experience helping customers with occupancy sensors when they decided to add them to their warehouse space. According to Mike Fuller, Manager of Sales and Operations for Whitehill, "Occupancy sensors are a key component of any energy conservation project we conduct for our customers."

The reason Whitehill decided to install the sensors is because "Even the most efficient lighting system can still save you money with the use of occupancy sensors. Most people focus solely on operating lighting systems more efficiently. We also stress the benefits associated with the use of occupancy sensors to turn lights off when needlessly left on." By installing occupancy sensors in their 7,000 square foot warehouse space, Whitehill was able to cut the 'on' time by 75 percent. Because the warehouse is only used occasionally throughout the day, energy was being wasted. Whitehill installed one Wattstopper passive-infrared hallway sensor in each aisle. They chose not to use ultrasonic sensors since they would detect too wide an area. With the infrared setup, only the lights in the occupied aisle turn on.

Mike Fuller says, "It is not good enough to simply decide on using occupancy sensors; it is equally important to pick the right technology, position the sensor correctly, and set the sensor controls appropriately." Taking these criteria into consideration will maximize energy savings and user acceptance.

Facility Information

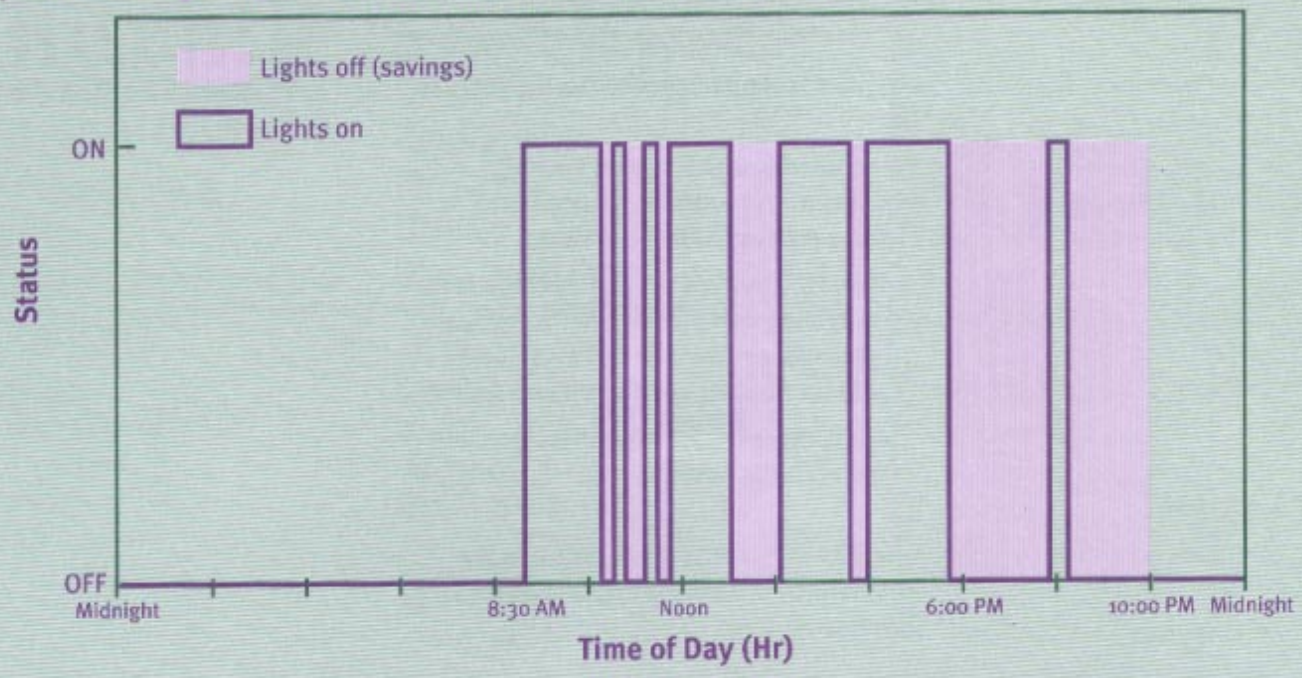
Square footage	7,000
Fixtures	28 - F96T8
Lamps per fixture	2
Controls	Infrared sensors
Hours per year	3120 (base case)
	780 (upgrade)

Equipment Information

Wattstopper passive infrared hallway sensors

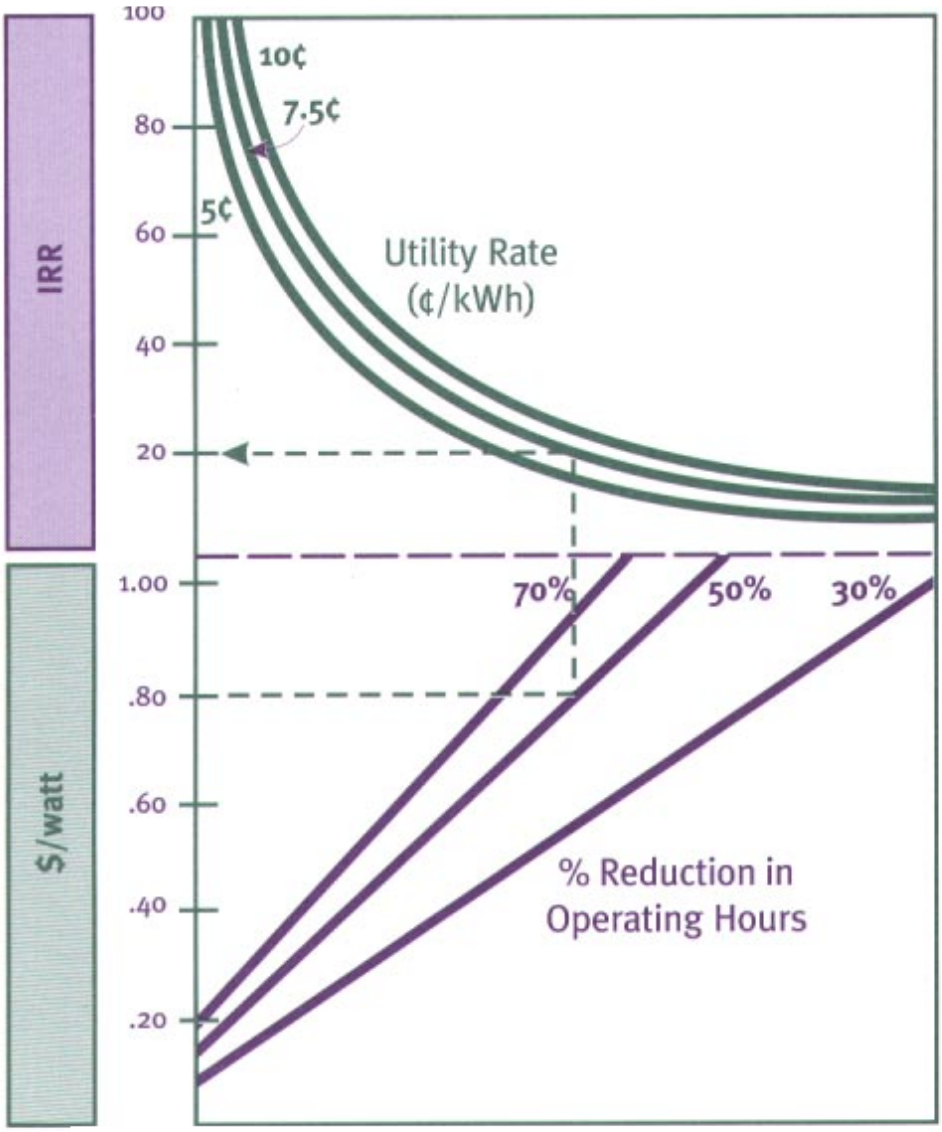
> *"The proper use of occupancy sensors can make a good lighting upgrade an outstanding upgrade."*
>
> ***- Mike Fuller***
> ***Manager of Sales and Operations***

Comparison of Lighting Hours With and Without an Occupancy Sensor



WILL IT WORK FOR YOU?

COST ANALYSIS FOR OCCUPANCY SENSOR CONTROL



Use this graph to estimate the cost-effectiveness of occupancy sensors in your industrial facility.

1. Determine your installed cost of the occupancy sensor system per watt controlled, and mark this point on the graph. *For example, $8,000 installed cost for controlling a 10,000 watt lighting load would be $0.80/watt.*
2. Draw a horizontal line from this point until it intersects the line that represents the estimated percentage reduction in lighting operation due to the installations of occupancy sensors. *For our example, we estimate that a 50% reduction in operating hours will result due to the installation of occupancy sensors.*
3. Draw a vertical line from this point until it intersects the curve that represents your average electricity rate. *In our example, the electricity rate is 7.5 cents per kilowatt-hour.*
4. Draw a horizontal line from this point until it intersects the vertical axis that measures the after-tax internal rate of return. *Our sample upgrade earns an after tax internal rate of return of 20 percent.*

The Green Lights Program offers 2-day Lighting Upgrade Workshops, Application Profile brochures, and other technical support services to assist program participants in applying cost-saving lighting strategies. For more information, call the Green Lights Hotline at 1-888-STAR-YES.

Graph Assumptions

- Post-tax analysis: marginal income tax rate of 30 percent. (Tax-exempt entities will earn a higher internal rate of return on their investment than what is determined in the graph.)
- 3 percent inflation for energy and maintenance costs.
- 6,000 hours per year of lighting operation.
- No demand savings assumed. Depending on when the lights are turned off, savings in peak demand charges can be significant. Contact your utility representative.